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LOWER URINARY TRACT SYMPTOMS IN 1,912 APPARENTLY HEALTHY PERSONS OF BOTH SEXES

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We aimed to evaluate lower urinary tract symptoms (LUTS) in apparently healthy persons of both sexes using the International Prostate Symptom Score (IPSS) and quality of life index (IPSS-QI) as related to aging. A total of 1,912 apparently healthy participants (1,052 women and 860 men) were enrolled in this study. They were informed as to the nature of the study and asked to fill out the IPSS questionnaires. The mean age of women was 46.8 years (range 18.0 to 83.0) and that of men was 48.5 years (range 19.0 to 76.0). The storage and voiding symptom scores gradually increased in parallel with increasing age in both sexes. The proportion of participants with moderate to severe symptoms (IPSS 8 or greater) increased from 5.6% in women younger than 30 years to 8.9, 15.7, 20.8, 21.0% and 28.6% for women 30 to 39, 40 to 49, 50 to 59, 60 to 69 and 70 years or older, respectively; the corresponding distribution for men was from 8.8 to 15.9, 18.7, 38.1, 48.6 and 68.8%, respectively. In both sexes, the majority of persons showed 1 or less nocturia. The distribution of IPSS-QI was very similar within each category of the IPSS severity in both sexes, showing that LUTS was equally bothersome to both sexes.

These data should be taken into account to evaluate LUTS in both sexes.

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Key words : Apparently healthy persons, LUTS, Both sexes, QOL

INTRODUCTION

The last taboo of modern urology is urinary incontinence and lower urinary tract symptoms (LUTS)¹. Although LUTS affect more than 10 million Japanese, it is estimated that perhaps only 18.0% of such patients have sought medical help². Urinary incontinence and LUTS, of course, have little or no impact on mortality, but interfere with participation in social activities thereby promoting social isolation and predisposing to depression. Recently, the International Continence Society reported a new definition of LUTS³. There are many conditions affecting LUTS, such as BPH, urinary incontinence, overactive bladder (OAB) and other factors. In these conditions, voiding dysfunction in a geriatric population is an important factor of LUTS in both sexes^{4,5}.

Scoring systems have been developed to quantify LUTS so as to assess the severity and degree LUTS are bothersome and their influence on quality of life (QOL). The International Prostate Symptom Score (IPSS) is one of the most popular self-administered questionnaires in which seven symptoms are scored from 0 to 5. Summation of the scores allows for classification of LUTS as mild (total score, 0 to 7), moderate (total score, 8 to 19), or severe (total score, 20 to 35). In addition, there is a quality of life index (IPSS-QI) (score, 0 to 5) that rates the degree of the symptoms⁶. Previous studies comparing the distribution of IPSS in women and men have shown that the total IPSS scores among

women were comparable to the scores among men^{7–9}.

The aims of this investigation were to accumulate fundamental data of LUTS and to compare the following aspects of LUTS in apparently healthy male and female persons according to age group: (a) LUTS in general, (b) differences in storage and voiding symptoms, (c) micturition during the night, and (d) the impact of LUTS on being bothersome.

PARTICIPANTS AND METHODS

Participants and Questionnaires

From January to May, 2003 the apparently healthy subjects who underwent multiphasic health screening in our Medical Checkup Center of Ube Industries Central Hospital were informed as to the nature of this study and asked to fill out the questionnaires of International Prostate Symptom Score (IPSS) with IPSS QOL index (IPSS-QI)⁶. The IPSS questionnaires were translated into Japanese by the Japanese Urological Association¹⁰. The institutional review board approved the study because these questionnaires were anonymous, and participants were requested to disclose their age and sex only. In the present study, therefore, data from the questionnaires and health screening could not be linked together, and no information could be obtained on past and concurrent disease or medications.

All participants were Japanese and lived in or around Ube city.

Terminology

We followed the Standardisation of Terminology of

Lower Urinary Tract Function by the International Continence Society³⁾ We defined storage score as denoting the sum of the frequency score plus urgency score plus nocturia score, and the voiding score as the sum of the incomplete emptying score plus intermittency score plus weak stream score plus straining score.

The severity of symptoms according to total IPSS was classified as none (score of 0), mild (1 to 7), moderate (8 to 19), and severe (20 to 35); the QOL score was categorized as mild (0 to 1), moderate (2 to 4), and severe (5 to 6).

Statistical Study

The differences between women and men in the storage, voiding and total IPSS score, as well as the IPSS-QI, were analyzed by the Mann-Whitney's *U* test. The differences between each age group by gender in these scores were analyzed by the Kruskal-Wallis rank test.

The relationships between total IPSS scores, storage or voiding symptom scores and IPSS-QIs were analyzed with Pearson's partial correlation coefficient controlling for age, and multiple linear regression analysis was used to evaluate interaction terms using age, storage and voiding symptom scores in which the impact of IPSS-QI was the end point.

A probability (*P*) value of less than 0.05 was considered statistically significant.

RESULTS

Participants

From January to May, 2003 the 1,912 apparently healthy participants who visited the Medical Checkup Center of Ube Industries Central Hospital for medical checkups were enrolled in this study. One thousand and fifty-two participants (55%) were women, and 860 (45%) were men. The mean age of the women was 46.8 years (range 18.0 to 83.0) and that of men was 48.5 years (range 19.0 to 76.0). In both sexes, participants in the 6th decade represented the largest age group (Fig. 1).

Storage Symptom Scores by Gender and Age Group

Table 1 shows storage symptom scores in both sexes according to each decade. In women and men, the storage score gradually increased in parallel with

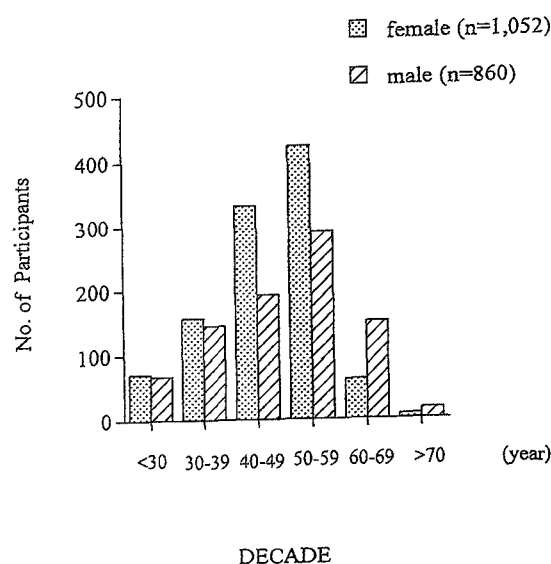


Fig. 1. Age distribution of the female and male study participants.

increasing age. There were significant differences between each age group in women ($P < 0.0001$) and men ($P < 0.0001$), respectively. On the other hand, there were no significant differences between storage score in each age group in either sex.

Voiding Symptom Scores by Gender and Age Group

Table 2 shows the voiding symptom scores in both sexes according to each decade. There were also significant differences between each age group in women ($P < 0.0001$) and men ($P < 0.0001$), respectively.

Except for the less-than-30-year age group, men had significantly higher voiding scores through all decades than women ($P < 0.001$).

Total International Prostate Symptom Scores by Gender and Age Group

Table 3 shows the total IPSS in both sexes according to each decade. The mean (25th, 75th percentile) IPSS total score was significantly higher among men [6.11 (2.00, 8.00)] than among women [4.42 (2.00, 6.00)] ($P < 0.0001$).

Except for the less-than-30-year age group and 40 to 49-year age group, men had significantly higher total

Table 1. Storage symptom score distributions according to each decade in women and men.

Status by age	Women				Men			
	n	Mean	Median	Q1, Q3	n	Mean	Median	Q1, Q3
<29	72	2.06	2.00	1.00, 3.00	68	2.41	2.00	1.00, 3.00
30-39	157	2.38	2.00	1.00, 3.00	145	2.49	2.00	1.00, 4.00
40-49	331	2.62	2.00	1.00, 4.00	192	2.47	2.00	1.00, 4.00
50-59	423	3.17	3.00	1.00, 4.00	289	3.18	3.00	2.00, 4.00
60-69	62	3.08	3.00	2.00, 4.00	150	3.80	4.00	2.00, 5.00
>70	7	3.86	4.00	1.00, 5.75	16	4.38	3.50	2.00, 7.50
All	1,052	2.80	2.00	1.00, 4.00	860	2.97	3.00	1.00, 4.00

KEY: Q1, Q3=25th and 75th percentiles.

Table 2. Voiding symptom score distributions according to each decade in women and men. All *P* values for women versus men of same age group.

Status by age	Women				Men			
	n	Mean	Median	Q1, Q3	n	Mean	Median	Q1, Q3
<29	72	1.11	1.00	0.00, 2.00	68	1.18	0.00	0.00, 2.00
30-39* ¹	157	1.06	0.00	0.00, 1.00	145	1.92	1.00	0.00, 3.00
40-49* ²	331	1.58	1.00	0.00, 2.00	192	2.29	2.00	0.00, 4.00
50-59* ³	423	1.88	1.00	0.00, 3.00	289	3.97	3.00	1.00, 6.00
60-69* ⁴	62	1.89	1.00	0.00, 3.00	150	4.59	3.00	1.00, 7.00
>70* ⁵	7	1.14	0.00	0.00, 2.25	16	4.63	4.50	1.50, 7.00
All	1,052	1.61	1.00	0.00, 2.00	860	3.15	2.00	0.00, 5.00

KEY: Q1, Q3=25th and 75th percentiles. KEY: *1, *2, *3, *4, and *5; *P*<0.001.**Table 3.** Total international prostate symptom score distributions according to each decade in women and men. All *P* values for women versus men of same age group.

Status by age	Women				Men			
	n	Mean	Median	Q1, Q3	n	Mean	Median	Q1, Q3
<29	72	3.15	3.00	1.00, 5.00	68	3.59	3.00	1.00, 5.00
30-39* ¹	157	3.45	3.00	1.00, 5.00	145	4.42	3.00	1.00, 6.00
40-49	331	4.20	4.00	2.00, 6.00	192	4.74	4.00	2.00, 7.00
50-59* ²	423	5.07	4.00	2.00, 7.00	289	7.13	6.00	3.00, 10.00
60-69* ³	62	4.98	5.00	2.00, 7.00	150	8.39	7.00	4.00, 12.00
>70* ⁴	7	5.00	4.00	1.00, 7.50	16	9.00	9.00	6.00, 10.50
All	1,052	4.42	4.00	2.00, 6.00	860	6.11	5.00	2.00, 8.00

KEY: Q1, Q3=25th and 75th percentiles. KEY: *1 and *4; *P*<0.05, *2; *P*<0.0001, *3; *P*=0.0002.

IPSS scores over all other decades than women.

The proportion of participants with moderate to severe symptoms increased from 5.6% in women younger than 30 years to 8.9, 15.7, 20.8, 21.0 and 28.6% for women 30 to 39, 40 to 49, 50 to 59, 60 to 69 and 70 years or older, respectively; the corresponding distribution for men was from 8.8 to 15.9, 18.7, 38.1, 48.6 and 68.8%, respectively (Table 4).

Nocturia

The mean (\pm standard deviation) micturition during the night was 0.5 (\pm 0.8) times in women and 0.7 (\pm 0.9)

times in men. In both sexes, except for the more than 70-year age group of men, the majority of the persons showed 1 or less nocturia.

IPSS QOL Index by Gender and Age Group

Table 5 shows the distribution of categories of bothersome in both sexes according to each decade. The proportion of participants in the moderate or severe category was from 31.9% in women younger than 30 years to 33.1, 42.0, 45.6, 46.8 and 28.6% for women 30 to 39, 40 to 49, 50 to 59, 60 to 69 and 70 years or older, respectively; the corresponding distribution for men was

Table 4. Severity of IPSS distributions according to each decade in women and men.

Total IPSS	Women					Men				
	n	None	Mild	Moderate	Severe	n	None	Mild	Moderate	Severe
Status by Age										
<29	72	9 (12.5)	59 (81.9)	4 (5.6)	—	68	6 (8.8)	56 (82.4)	6 (8.8)	—
30-39	157	19 (12.1)	124 (79.0)	13 (8.3)	1 (0.6)	145	18 (12.4)	104 (71.7)	21 (14.5)	2 (1.4)
40-49	331	33 (10.0)	246 (74.3)	52 (15.7)	—	192	21 (11.0)	135 (70.3)	35 (18.2)	1 (0.5)
50-59	423	34 (8.0)	301 (71.2)	83 (19.6)	5 (1.2)	289	14 (4.8)	165 (57.1)	97 (33.6)	13 (4.5)
60-69	62	8 (12.9)	41 (66.1)	13 (21.0)	—	150	3 (2.0)	74 (49.4)	65 (43.3)	8 (5.3)
>70	7	—	5 (71.4)	2 (28.6)	—	16	—	5 (31.2)	11 (68.8)	—
All	1,052	103 (9.8)	776 (73.7)	167 (15.9)	6 (0.6)	860	62 (7.2)	539 (62.7)	235 (27.3)	24 (2.8)

KEY: IPSS=International Prostate Symptom Score. Data in parentheses are percentage within each decade. Category of IPSS severity: none (total IPSS score of 0), mild (1 to 7), moderate (8 to 19), and severe (20 to 35).

Table 5. Distributions of three categories of bothersome according to each decade in women and men. All *P* values for women versus men of same age group.

IPSS-QI	Women				Men			
	n	Mild	Moderate	Severe	n	Mild	Moderate	Severe
Status by Age								
<29	72	49 (68.1)	23 (31.9)	—	68	41 (60.3)	27 (39.7)	—
30–39	157	105 (66.9)	51 (32.5)	1 (0.6)	145	91 (62.8)	53 (36.5)	1 (0.7)
40–49	331	192 (58.0)	130 (39.3)	9 (2.7)	192	106 (55.2)	85 (44.3)	1 (0.5)
50–59* ¹	423	230 (54.4)	176 (41.6)	17 (4.0)	289	115 (39.8)	158 (54.7)	16 (5.5)
60–69* ²	62	33 (53.2)	26 (42.0)	3 (4.8)	150	56 (37.3)	80 (53.4)	14 (9.3)
>70	7	5 (71.4)	2 (28.6)	—	16	7 (43.8)	9 (56.2)	—
All	1,052	614 (58.4)	408 (38.8)	30 (2.8)	860	416 (48.4)	412 (47.9)	32 (3.7)

KEY: IPSS-QI=International Prostate Symptom Score QOL Index. Data in parentheses are percentage within each decade. Category of bother: mild (IPSS-QI of 0 to 1), moderate (2 to 4), and severe (5 to 6). *¹; *P*<0.001, *²; *P*=0.010.

Table 6. Distribution of three categories of bothersome within each category of IPSS severity in women and men.

Total IPSS-score	IPSS-QI							
	Women				Men			
	n	Mild	Moderate	Severe	n	Mild	Moderate	Severe
None	103	96 (93.2)	7 (6.8)	—	62	59 (95.2)	3 (4.8)	—
Mild	776	489 (63.0)	272 (35.1)	15 (1.9)	539	334 (62.0)	204 (37.8)	1 (0.2)
Moderate	167	29 (17.4)	128 (76.6)	10 (6.0)	235	23 (9.8)	195 (83.0)	17 (7.2)
Severe	6	—	1 (16.7)	5 (83.3)	24	—	10 (41.7)	14 (58.3)
All	1,052	614 (58.4)	408 (38.8)	30 (2.8)	860	416 (48.4)	412 (47.9)	32 (3.7)

KEY: IPSS=International Prostate Symptom Score, IPSS-QI=International Prostate Symptom Score QOL Index. Data in parentheses are percentages within each category of IPSS severity. Category of bother: mild (IPSS-QI of 0 to 1), moderate (2 to 4), and severe (5 to 6). Category of IPSS severity: none (total IPSS score of 0), mild (1 to 7), moderate (8 to 19), and severe (20 to 35).

increased from 39.7% to 37.2, 44.8, 60.2, 62.7 and 56.2%, respectively (Table 5).

The IPSS-QI was significantly greater in men than in women in the 6th (*P*<0.0001) and 7th decade (Table 5, *P*=0.010). In women, no significant differences in the IPSS-QI between each age group were found (*P*=0.399). On the other hand, in men, there were significant differences in the IPSS-QI between each age group (*P*<0.0001). The relationships between the total IPSS score and IPSS-QI are shown in Table 6. The percentage of the three categories of the severity of IPSS-QI was similar between women and men for each of the four categories of the severity of IPSS. The partial correlation coefficient between total IPSS score and IPSS-QI was 0.683 in women and 0.694 in men, showing a moderate positive correlation between them. The partial correlation coefficient between the storage symptom score and IPSS-QI was 0.584 in women and 0.535 in men, and between the voiding symptom score and IPSS-QI was 0.574 and 0.663, respectively. All the partial correlation coefficients were statistically significant (*P*<0.0001). Among men, the voiding symptom score correlated more closely with the IPSS-QI than did the storage symptom score, and this finding

was reversed among women. On the multiple linear regression analysis, the resulting prediction equations were:

$IPSS-QI = 0.860 - (0.072 \times Age) + (0.415 \times Storage) + (0.396 \times Voiding)$, for women ($R^2 = 0.464$, *P*<0.0001) and $IPSS-QI = 1.011 - (0.051 \times Age) + (0.248 \times Storage) + (0.550 \times Voiding)$, for men ($R^2 = 0.499$, *P*<0.0001).

Also from the standard regression coefficients of these equations, the storage symptom scores in women and the voiding symptom scores in men correlated more closely with the IPSS-QI. The partial regression coefficients for the storage and voiding symptom scores were 0.454 in women and 0.583 in men, and these were statistically significant (*P*<0.0001).

DISCUSSION

Of the various factors of LUTS, urge urinary incontinence and storage symptom are particularly common, and can be distressing to many people. These symptoms disturb the patients during both daytime and nighttime, and during work and sleep. Overactive bladder (OAB) is a recently defined symptom complex that includes urinary urgency with or without urge incontinence, urinary frequency, and nocturia (=storage

symptom)³⁾ In a study from Europe, 17% of women and 16% of men aged 40 years or older reported syndromes suggestive of OAB¹¹⁾. Also in a study from Japan, the prevalence of OAB was 12.4% , which consisted of 6.4% with urge incontinence and 6.0% without it²⁾ To obtain fundamental data to clarify the prevalence of LUTS, differences in storage and voiding symptoms, the normality of nocturia, and the symptoms correlated with IPSS-QI in apparently healthy persons in Japan, we started this study.

A potential limitation of our study was that it was not a population-based study, and the enrolled subjects were derived from a health screening population. The proportion of participants aged 70 years or older was very small, and thus the present study may not reflect the general prevalence of LUTS in the Japanese population. Nevertheless we believe that the present study still permitted a comparison of LUTS between women and men in the same age group. In our participants, the 6th decade was the most frequently visiting age in both sexes, and woman the more frequently visiting sex. But after the 7th decade men more frequently visited (Fig. 1). One of the reasons for this might be the fact that the 7th decade is the age of retirement for men, and they were anxious about their physical health and wished to know how long they could survive.

In both sexes, the storage symptom score gradually increased in parallel with increasing age, and there was a significant difference between each age group, but the storage symptom score was not significantly different between women and men in each same age group (Table 1). Terai et al. reported very similar data on the age-related development of storage symptom score in both sexes⁹⁾. They also enrolled individuals who underwent multiphasic health screening and the age distribution of the subjects was slightly younger than ours. In women the voiding symptom was not so prominent, but the score increased with aging. Except in the less-than-30-year age group, men had significantly higher voiding scores through all other decades than women (Table 2). Schatzl et al. reported a cross-sectional study on this issue, enrolling 1,191 women and 1,211 men. Beyond the age of 60 years, voiding symptoms increased substantially in men only. The mean increase in voiding symptoms per life decade was 3.2% for women and 6.6% for men¹²⁾ The total IPSS score also was significantly greater in men than in women (Table 3).

Boyle et al. reported the percentage of moderate to severe IPSS scores in those in their 40s, 50s, 60s, and 70s was 10.6, 19.0, 30.5 and 40.4%, respectively, in men and 15.5, 18.2, 23.8 and 28.7%, respectively, in women¹³⁾ Terai et al. reported an almost same finding⁹⁾ The common finding of these and our studies is that the age-related increase in LUTS is a phenomenon seen in women and men.

In both sexes, the mechanisms leading to the increase in LUTS with advancing age remain to be fully

understood. Madersbacher et al. conducted a study on this issue, enrolling 183 women and 253 men 40 years or older. The age-associated urodynamic changes in both sexes are comparable for a number of changes. In both sexes, decreases in peak flow rate, average flow rate, voided volume and bladder capacity occur, whereas increases in postvoid residual volume are seen with advancing age⁴⁾ The prevalence of detrusor instability is substantially higher for women until the age of 70 years, whereas in men the prevalence increases with progressing age⁴⁾.

Desgrandchamps et al. reported a study on this issue, enrolling 161 women between the ages of 25 and 76 years, consulting a general practice for problems other than voiding disorders. They concluded that nocturia is a normal finding provided it occurs less than or equal to 2 per night¹⁴⁾ In the present study, except for the more than 70-year age group of men, the majority of persons showed 1 or less nocturia. In their population-based investigation on LUTS, Homma et al. determined the most common problematic symptom was nocturia²⁾ Taking together the results of all of these and our studies, nocturia should not be decided to be a normal finding by only its frequency.

Terai et al. determined the percentage with moderate to severe bother (QOL scores of 2 or greater) was 38.4% in women and 47.6% in men⁹⁾ In the present study, the corresponding percentage was 41.6% in women and 51.6% in men. They also found the similarity of the impact of LUTS on the QOL in both sexes, which is consistent with our findings. Taken together, the impact of LUTS on being bothersome is equal between women and men.

CONCLUSION

To know the urinary symptom score in apparently healthy persons of both sexes is an essential step in the understanding of voiding disorders and in the evaluation of treatment.

Our data showed the storage and voiding symptom scores gradually increased in parallel with increasing age in both sexes, and men had significantly higher voiding scores through all decades than women. In both sexes, the majority of persons showed 1 or less nocturia. In addition, the impact of LUTS on being bothersome was similar in both sexes. These data should be taken into account to evaluate LUTS in both sexes.

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和文抄録

宇部興産中央病院健診センターを受診した
男女1,912人における下部尿路症状の検討島袋 智之¹, 高橋陽二郎², 内藤 克輔³¹宇部興産中央病院泌尿器科, ²宇部興産中央病院健診センター³山口大学医学部特殊専門領域腫瘍病態学教室 (泌尿器科)

健康診断のために当院の健診センターを訪れた男女1,912人に、国際前立腺症状スコア (IPSS) と生活の質の指標 (IPSS-QI) を用いたアンケート調査を行い、通常の日常生活を送っている人々における下部尿路症状 (LUTS) の出現頻度を、性別・年齢別に比較検討した。

平均年齢は女性 (1,052人) が46.8歳 (18~83歳)、男性 (860人) が48.5歳 (19~76歳) であった。蓄尿症状および排尿症状スコアは、男女とも加齢とともに徐々に増大した。IPSS が8点以上の中等度および高度の症状を有する人は、30歳未満の女性で5.6%、30歳

代で8.9%、40歳代で15.7%、50歳代で20.8%、60歳代で21.0%、70歳以上で28.6%であった。一方、男性ではそれぞれ8.8, 15.9, 18.7, 38.1, 48.6, 68.8%であった。また、70歳以上の男性を除いては、男女ともに大部分の人が1回以下の夜間排尿回数であった。加えて、IPSS 重篤度別の IPSS-QI でみた困窮度は男女共ほぼ同様で、LUTS は両性に同程度の困窮さを与えていた。

これらの結果は、男女における LUTS を評価する際に、考慮に入れる必要があると思われた。

(泌尿紀要 52: 189-195, 2006)